



RESEARCH PROJECT CAPSULE [24-1B]

February 2024

TECHNOLOGY TRANSFER PROGRAM

Sustainability through Development of Life Cycle Information Models for Pavements in Louisiana

JUST THE FACTS:

Start Date:

October 1, 2023

Duration:

48 months

End Date:

September 30, 2027

Funding:

TT-Fed/TT-Reg-5

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POINTS OF INTEREST:

Problem Addressed / Objective of
Research / Methodology Used /
Implementation Potential

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PROBLEM

The asphalt pavement production industry has set an ambitious goal of achieving net zero greenhouse gas (GHG) emissions associated with the production of asphalt pavements. To reach net zero carbon, the industry must understand, identify, and continue to reduce both the carbon intensity of materials used in, and energy consumption associated with, the production of asphalt pavement mixtures. FHWA launched the Climate Challenge Initiative in early 2022 to quantify the impacts of sustainable pavements. As part of the U.S. Department of Transportation's ongoing work to address climate change, this initiative demonstrates several ways to reduce GHG emissions in highway projects using sustainable construction materials. This study will address climate change through the development of life cycle assessment (LCA) models for pavements in Louisiana. LCA is a tool for evaluating materials' sustainability that quantifies environmental impacts over the full life cycle of pavements from cradle to grave. This includes materials production, design, construction, use, maintenance and rehabilitation, and end of life stages.

OBJECTIVE

The goal of this study is to improve sustainability through development of life cycle information (LCA) models for pavements in Louisiana.

METHODOLOGY

The proposed research will be conducted according to the tasks listed below:

Task 1: Conduct Literature Review

Collect and review information from a variety of sources, including (but not limited to) OpenLCA website and Federal LCA Commons, that detail completed and ongoing studies on the effects of climate change on pavement and pavement LCA.

Task 2: Develop and Deliver Project Kickoff Training

Launch a kickoff meeting at the start of the project through an educational symposium to educate partners and agencies on Environment Product Declarations (EPDs), LCA, and Net-Zero emissions.

Task 3: Conduct LCA Case Studies on Selected Projects and Collect EPDs

The research team will perform case studies on the implementation of LCA for several ongoing DOTD projects using the life cycle inventories from LCA Commons Database. Researchers will collaborate and coordinate with contractors, materials suppliers, and DOTD staff to identify suitable Case Study project(s) that use technologies currently being implemented by the state.

Task 4: Assist in the Development of Open-Sourced and Regional Binder EPDs

The research team will coordinate with Asphalt Institute to collect necessary data to develop inventories following American Center for Life Cycle Assessment (ACLCA) PCR Guidance. Candidate asphalt binder types considered will include conventional, bio binders, and more. The data inventories developed in this process will be made available to others through the Federal LCA Commons.

Task 5: Develop Standards and Frameworks to Quantify Environmental Impacts of Construction Practices

The research team will develop a set of potential AASHTO standards for data collection for various construction activities. Additionally, they will create an Open LCA model to represent these standards.

Task 6: Develop and Deliver Project Concluding Symposium

The research team will host a final symposium at the conclusion of the project, presenting the various case studies, lessons learned, and specifications developed throughout the project. The symposium will be hosted through the Louisiana Transportation Research Center's Transportation Training & Education Center.

Task 7: Prepare the Project Final Report

The research team will prepare a final report which includes: (1) standards for data collection and environmental impact quantification of various construction activities, (2) LCA framework for pavements in Louisiana, (3) data analysis, (4) implementation plan, (5) proposed specification, and (6) recommendations of this project.

IMPLEMENTATION POTENTIAL

The primary product of this research will be a life-cycle assessment (LCA) framework for pavements in Louisiana, which will cover material production and initial construction, maintenance phase, in-service phase, and end-of-life phase. The developed framework is expected to provide a guideline on the implementation of LCA for Louisiana pavements. This will help define pavement systems, guide decisions regarding potential changes to policies and practices, and identify potential unintended negative consequences, with the goal of reducing the impacts of pavements on humans and the environment.

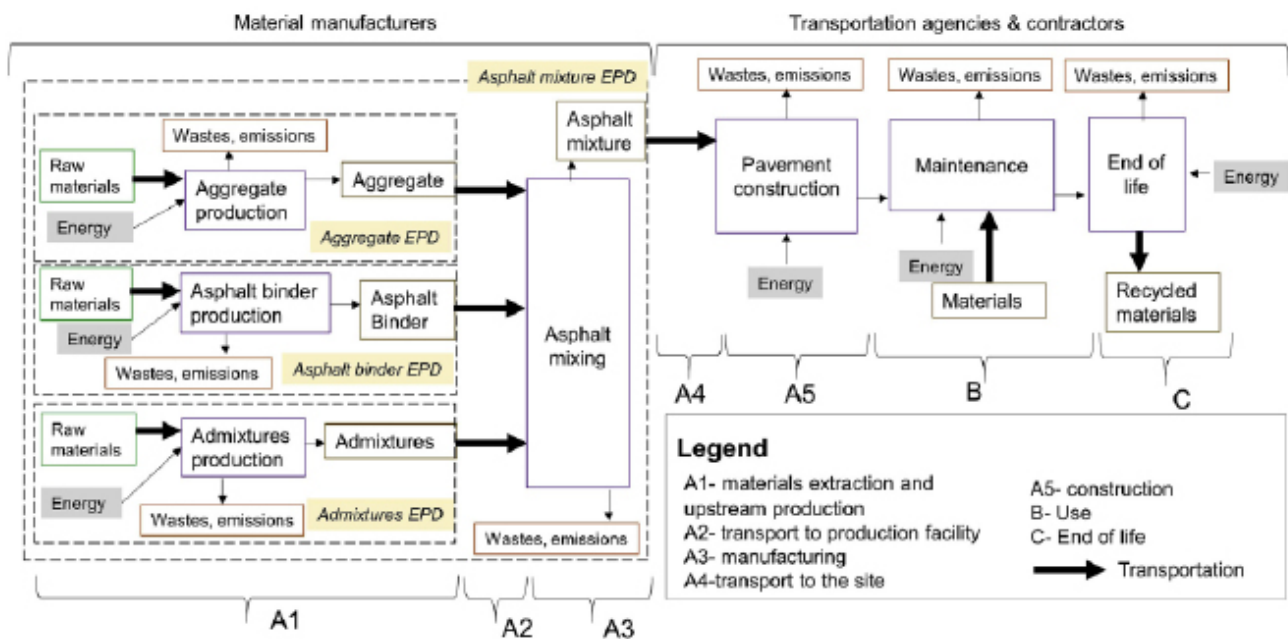


Figure 1. Example of asphalt pavement system boundary for LCA- cradle-to-grave